

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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25 YEAR RE-REVIEW

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PART II - REPORT - KUYBYSHEV ACTIVITY, U.S.S.R.

1. On the 22nd October, 1946, [REDACTED] JUNKERS and BMW personnel, were deported to KUYBYSHEV, U.S.S.R., on a site previously occupied by the experiment departments of the KUYBYSHEV power station. 25X1

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012 Engine

5. In the Spring of 1947 the assembly of the 012 was commenced, using parts brought from Germany. However, tests in the combustion chamber laboratory showed that a design change was necessary as follows:- The original 012 was designed with 12 individual combustion chambers; [] tests were made showing that an angular combustion chamber using fuel injected in the same direction as the air streams (tangential jet) resulted in more even temperature distribution and greater combustion efficiency. A total of 3 or 4 012s, incorporating these two modifications were built, and after several runs of over 200 hours these engines were packed and sent away to an unknown destination in 1948.

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022/AO engine (single entry spherical jets)

6. In addition to the 012 the design of the turboprop type 022 was in hand. Tests on the combustion chamber for the 022/AO were undertaken in the Spring of 1948, and the results compared unfavourably with the performance of the 012 modified combustion chamber. It was therefore decided to increase the chamber diameter and to reduce the head depth (volume to remain the same). This was done and the following result obtained: with mixture strength = M 60, combustion efficiency (ausbrandwirkungsgrad) was 80-85%.

(NOTE during tests following mixture strengths were used:-

M 60 = cruising: M 43 = starting: M 40 = full power).

022A engine (double entry tangential jets)

7. The difference between the 022/AO and A is as follows:- after diameter and depth modification previously referred to, an order was received to improve combustion efficiency still further. A new design was decided upon which reduced the length of the secondary portion of the combustion chamber by approximately 70%. The combustion efficiency rose, but under full power conditions the baffles inside the chamber burnt out at the edges. This was overcome in the re-design by ensuring that cool air flowed in the baffle vicinity. The re-design gave at mixture strength M 60, a combustion efficiency of 97-99%. Finally, two further modifications were made, viz:- the normal single spherical fuel jet was changed for double entry tangential jets. These jets could be used individually or together; and 2 pressure relief flaps (luftablasser klappen) were fitted. This engine in its final form was known as the 022A. It was finally completed during 1951 [] between 20-30 were built. In June 1953 the Russians informed [] that the 022A would be mass-produced, as it had made repeated successful 100 hrs. tests, and had passed the final state test runs.

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022M (The coupled 022As)

8. In the beginning of 1952 the coupling gearing for two coupled 022As were made. This coupled engine was known as the 022M. It was first run using the gears produced at KUYBYSHEV, and did 50 hrs. successfully. The Russians wanted to perform the final state test run in 1952, and placed an order for a Russian-made gear. When these gears arrived, they ran for between 15-30 hrs. before failure, and in 95% of the failures the same tooth broke.

[] the Russians wanted the 022M badly and sent away the broken gears to a measurements institute for specification tests. The specifications were found to be correct. (The Germans were puzzled since the gear produced by them was successful but superficially at least the Russian produced gears were an exact copy, and they therefore mistrusted the specification of the metal used in manufacture). The Germans then put forward the suggestion that the gearing be re-designed in order to prevent repeated meshing of the same teeth. []

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Sometime during 1952-53 the Russians stated that the 022M had been air-tested, but that on test the coupling gearing had broken. []

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022K

9. The K type engine is basically the 022A, but is designed to run at higher temperature and to give an improved performance. [redacted] the combustion chamber diameter is larger on this engine and that a divided head was used, the division was in the form of a slot through which air was allowed to escape and flow over the outside wall of the combustion chamber. The purpose of this modification was to reduce the combustion chamber external surface temperature in order to reduce warping. [redacted] successful runs were made with a temperature of 1200° Kelvin being reached just behind the turbine. [redacted]

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[redacted] the result of the test was received with enthusiasm among the design staff (German) and was the subject of much conversation. [redacted] the 022K was equipped with pressure relief flaps (exact number unknown), [redacted] the flaps close after a figure of 6000 RPM has been reached, [redacted] the purpose of the flap was to reduce the load on the starter, until a certain critical speed had been passed, after which the kinetic energy built up by the starter enabled the compressor to be turned against the rapidly rising pressure. [redacted]

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Ceramic Stator Blades

10. Towards the end of 1952 or beginning of 1953, a visit was paid to KUMBYSHCHEV by Russians (2 or 3 men) from MOSCOW. They brought with them two types of turbine stator blades (about 8-10 blades of each type) as follows:-

- (a) metal ceramic, coloured brown and black,
- (b) ceramic, dirty white in colour, and porous; very similar to the unglazed centre portion of a cracked china utensil.

In the Spring of 1953 two or three visitors from KIEV brought ceramic blades with them very similar in appearance to the blades already described. These visitors paid two or three visits; one of these visits lasted for 14 days. The last visit was paid in May 1953. The Russians worked alone, and at night in the combustion chamber test laboratory no Germans had anything to do with these blades. [redacted]

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[redacted] tests on these blades [redacted] gave the following information:

The blades had to be subjected to temperature variation of 200° - 1200°C for a hundred times. [redacted] the tests had been successful. [redacted]

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[redacted] experiments using ceramic blocks were carried out by Dr. LORENZ. [redacted]

Comparison NENE/022A combustion chamber efficiency

11. In the combustion chamber test department there was a NENE type combustion chamber (one only). [redacted]

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[redacted] Even the Russians, when discussing the jets, referred to the NENE, FORSUNKA (atomizer, jet).

During 1949 or 1950 they carried out comparison tests on the NENE chamber and a part of the 022A chamber. Test results showed that at mixture strength M 60 the NENE combustion efficiency was between 88-90%. The 022A, however, under the same conditions gave 98-99%. [redacted]

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[redacted] When they first completed the laboratory in 1947 temperature tests were made but readings varied so enormously that no reliance could be

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placed on any particular reading. It was then decided to use thrust measurement, as an aid to combustion efficiency computation. Air was drawn through the part of the combustion chamber under test by means of an electrically driven compressor. Outlet from the compressor was via a pipe bent in the form of a 'U'. One end of this pipe was attached to a balance; from the reading given, the value of the thrust could be obtained, and the combustion efficiency calculated. [redacted] two pressures came into the calculation [redacted] they were P₁ pressure in the pipe, and P₂ pressure just before entry to combustion chamber. (Note: [redacted] a 40 m.m. pitot head for temperature tests was available at KUYBYSHEV). [redacted]

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1.5 - 2 ATU. - fuel pressure [redacted] was the pressure used during tests at cruising speed [redacted] the lowest pressure used on any test was 0.9 ATU [redacted]

New Type Ignition

12. Sometime in 1953, [redacted] a Russian carrying a normal NENE head. The plug attached to the head, however, was of a different type. [redacted] the plug not only sparked but also glowed. [redacted] the Russian was a representative of a firm, and came to ZAVOD 2 to test the plug, or to interest the Russian chiefs in new ignition equipment.

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Supersonic Compressor

13. In June 1953, [redacted] rumours of tests being carried out by Russians in a small wind tunnel at KUYBYSHEV. The tests were on new type blades which were alleged to be for a supersonic compressor. The tests were not completely successful.

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KUYBYSHEV and Z(TS)IAM

14. [redacted] KUYBYSHEV as VERSUCHS WERK No. 2. [redacted] it was ZIAM. (Central Aeroengine Institute) [redacted]

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Aircraft factory beyond the URALS?

In 1950 the director of ZAVOD 2, OIESCHNOWISCH was removed, and replaced by KUSNITSOW, who brought with him approximately 25 of his staff. It was a topic of conversation that the staff came from "somewhere behind the URALS" and were familiar with the OC4 combustion chamber.

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